6.9.4

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, Washington 98101

IN REPLY
REFER TO: OEA-095 November 24, 1999

MEMORANDUM

SUBJECT: Bunker Hill, CLP Metals Analysis, Data Validation
Case: 27338
SDG: MJAK97

FROM: Laura Castrilli, Chemist
Quality Assurance and Data Unit, OEA

TO: Mary Kay Voytilla, Regional Project Manager
Office of Environmental Cleanup

CC: Bruce Woods, Region 10 CLP TPO
Jim Stefanoff, CH2M Hill

The following is a validation of ICP-AES and mercury analyses of ten dissolved water samples from the Bunker Hill project. The analyses were performed following the USEPA Contract Laboratory Program Statement of Work for Inorganics Analysis Multi-media, Multi-Concentration, ILM04.0. Analyses were conducted by Sentinel, Inc, of Huntsville, Alabama. This validation was conducted for the following samples:

MJAK97	MJAK99	MJAL01	MJAL03	MJAL05
MJAK98	MJAL00	MJAL02	MJAL04	MJAL06

Data Qualifications

The following comments refer to the Sentinel Laboratory's performance in meeting quality control specifications outlined in the *CLP Statement of Work (CLP-SOW) for Inorganic Analysis, rev. ILM04.0.* The comments presented herein are based on the information provided for the review.

1.0 Timeliness - Acceptable

The technical (40 CFR part 136) holding time from the date of collection for mercury in water is 28 days. The holding time for the remaining metals in water is 180 days. The samples were collected on 9/10/99. Mercury analyses were completed on 09/23/99. ICP-AES analyses were completed on 09/27/99.

2.0 Sample Preparation - Acceptable

The samples were prepared for mercury analyses on 09/22/99. The samples were prepared for ICP-AES analyses on 09/22/99. No qualification was made based on sample preparation.

3.0 Calibrations/Calibration Verifications -

The samples were analyzed for mercury by CVAAS on 09/23/99. Initial calibration included one blank and six standards. The curve was linear with a correlation coefficient greater than 0.995.

The samples were analyzed by ICP-AES on 09/22/99 (main analyses) and 09/23/99 (iron, manganese and/or zinc dilutions), and 09/27/99 (more manganese and zinc dilutions). The instrument was standardized according to the analytical method each day of analysis using one blank and a single calibration standard for each element.

All ICP-AES and CVAAS (mercury) calibrations were performed as required and met the acceptance criteria; therefore, no qualification was made on this basis.

Continuing calibration verifications (CCVs) are required before and after sample analysis and after every 10 samples during analysis. Mercury recoveries must be within 80-120%. Other metal recoveries must be within 90-110%. The frequency of analysis of CCVs was met. All ICP-AES and CVAAS (mercury) CCVs (initial and continuing) bracketing reported sample results met the recovery criteria; with the exception of the second CCV during the main analyses on 09/22/99. The recovery for iron, manganese and zinc was 137%, 115%, and 169%, respectively. The calibration blank ran immediately after this verification showed evidence of carry over for iron, manganese and zinc. A couple of samples ran before the CCV had levels of iron and manganese requiring up to a 100 fold dilution and levels of zinc requiring up to a 1000 fold dilution. The reported iron, manganese, and zinc data for samples ran before and after this CCV were examined for evidence of carry over (i.e. high bias). Based on this examination, the following results were qualified:

- zinc in samples MJAL00 and MJAL02 was qualified 'U', undetected
- iron in sample MJAL02 was qualified 'U'

All of the reported manganese results and the remaining reported iron and zinc results were all considerably higher than the estimated carry over and therefore, were not qualified on this basis.

4.0 Laboratory Control Samples - Acceptable

Laboratory Control samples are digested and analyzed along with the samples to verify the efficiency of laboratory procedures. All recoveries associated with reported sample results met the acceptance

criteria; therefore no qualification was made on this basis.

5.0 Blanks -

Procedural blanks were prepared with the samples to show potential contamination from the digestion or analytical procedure. If an analyte was found in the associated blank, the sample results were qualified if the analyte concentration was less than five times the analytical value in the blank.

Chromium in the preparation blank had a negative result with an absolute value greater than the detection limit. Aluminum, barium, cadmium, cobalt, iron, magnesium, manganese, selenium, and zinc were detected in one or more continuing calibration blanks (CCBs). Nickel in a CCB had a negative result with an absolute value greater than the detection limit. Based on blank contamination, associated sample results were qualified as follows:

- barium in samples MJAK99, MJAL00, and MJAL04 was qualified 'U'
- cadmium in sample MJAL00 was qualified 'U'
- chromium in samples MJAL00, MJAL01, MJAL02, and MJAL03 was qualified 'J' or 'UJ'
- zinc in sample MJAL00 was qualified 'U'

All other sample results were greater than five times the associated blank levels (or were already undetected) and were not qualified based on blank contamination.

6.0 ICP-AES Interference Check Sample -

The interference check sample (ICS) is analyzed by ICP-AES to verify interelement and background correction factors. Analysis is required at the beginning and end of each sample analysis run and recoveries must be between 80% and 120%. All ICS recoveries associated with reported sample results were within the recovery criterion; with the exception of the manganese recovery (143% average recovery, true value = 45 ug/L) in two of the three ICS-A analyses on 9/22/99. The ICS-AB recoveries for manganese were all acceptable (true value = 484 ug/L). No manganese results were qualified based on the ICS-A recovery as all the manganese sample results were at levels closer to or greater than the ICS-AB manganese level.

The raw data for a number of samples had interfering levels of iron and/or manganese. Analytes for which iron and/or manganese is an interferent were qualified as follows:

- Antimony in samples MJAK97, MJAK99, MJAL01, MJAL04, MJAL05, and MJAL06 was qualified 'UJ', estimated detection limit (unknown bias - possible false positives or negative due to high iron). Antimony in sample MJAK98 was qualified 'J', estimated (unknown bias). Antimony in two of the three ICS-A analyses bracketing these samples had one positive and one negative result greater

than the detection limit.

- Aluminum in sample MJAL06 was qualified 'UJ', estimated detection limit (possible false positive due to high manganese). Analyte equivalents in Table 2 of ILM04.0 were used to estimated the interference with aluminum due to manganese at levels > 45 mg/L.

- Chromium in samples MJAK97, MJAL01, MJAL04, and MJAL06 was qualified 'UJ', estimated detection limit (possible false positives due to high manganese). Analyte equivalents in Table 2 of ILM04.0 were used to estimated the interference with chromium due to manganese at levels > 45 mg/L.

- Vanadium in samples MJAK97, MJAK98, MJAK99, MJAL01, MJAL04, MJAL05, and MJAL06 was qualified 'UJ', estimated detection limit (possible false negatives due to high iron). Vanadium in all three of the ICS-A analyses bracketing these samples had negative results with absolute values greater than the detection limit.

Some of the samples required one or more dilution runs to report iron, zinc, and/or manganese results within the instrumental linear range. The raw data for all analytes were compared using the available dilutions to see if 1) zinc and/or manganese levels in the undiluted samples were high enough that interelement corrections may not be sufficient for the analytes that were reported from the undiluted analysis or 2) a pattern of suppression or enhancement was evident.

This review was limited to an assessment of just cadmium, iron, manganese, lead, and zinc results. Based on this assessment, cadmium in samples MJAK98 and MJAL01 was qualified 'J' (evidence of suppression) and manganese in sample MJAK98 was qualified 'J' (evidence of suppression).

7.0 Duplicate Analysis - Acceptable

Duplicate analyses were done on sample MJAK97. Water duplicate results were within the ±20% Relative Percent Difference (RPD) or ±CRDL criteria for water results < 5 times the CRDL criteria. No qualification was made based on duplicate results.

8.0 Field Duplicate Analysis - Not Applicable

Field duplicate analysis for samples in this SDG was not indicated in the field collection documentation.

9.0 Matrix Spike Analysis -

Matrix spike sample analyses are done to provide information about the effect of the sample matrix on digestion and measurement methods. Matrix spike recovery must be within the limits of 75 - 125%.

Matrix spike analyses were done on sample MJAK97. All matrix spike

recoveries were within the required QC limits, with the exception of antimony (63%), selenium (149%), and thallium (57%). All antimony and thallium results were qualified 'J', estimated (possible low bias for most results, unknown bias for samples that also had qualification due to suspected iron interference). Detected selenium results were qualified 'J', estimated (possible high bias).

10.0 Graphite Furnace Atomic Absorption Spec (GFAAS) QC - Not Applicable - GFAAS was not used for the analysis of these samples.

11.0 ICP-AES Serial Dilution - Acceptable

Sample MJAK97 was analyzed by ICP-AES serial dilution to check for potential interferences. All analytes which exceeded the minimum concentration criterion (50 times the IDL) agreed within the 10%D criteria; therefore no qualification was made on this basis.

12.0 Detection Limits - Acceptable

Sample results which fall below the instrument detection limit (IDL) are assigned the value of the instrument detection limit and the 'U' qualifier is attached. Contract Required Detection Limit (CRDL) standards are required to demonstrate a linear calibration curve near the CRDL. CRDL standards were run at the required frequency.

13.0 Overall Assessment of the Data

This validation of the data is based on the criteria outlined in the *National Functional Guidelines for Inorganic Data Review (02/94).* Approximately 22% of the data was qualified based on blank contamination, carry over, interference and/or matrix spike recovery.

Below are the definitions for the National Functional Guidelines for Inorganic Data Review (02/94) qualifiers used when validating/qualifying data from Inorganic analysis.

DATA QUALIFIERS

U - The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

J - The associated value is an estimated quantity.

R - The data are unusable. (Note: Analyte may or may not be present.)

UJ - The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJAK97

Lab Name: SENTINEL INC. Contract: 68-D6-0001

Lab Code: SENTIN Case No.: 27338 SAS No.: SDG No.: MJAK97

Matrix (soil/water): WATER Lab Sample ID: 24782S

Level (low/med): LOW Date Received: 09/11/99

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	9240			P
7440-36-0	Antimony	2.2	U	~~N~~J	P
7440-38-2	Arsenic	279			P
7440-39-3	Barium	11.2	B		P
7440-41-7	Beryllium	2.9	B		P
7440-43-9	Cadmium	564			P
7440-70-2	Calcium	34100			P
7440-47-3	Chromium	2.9	~~B~~	(J)	P
7440-48-4	Cobalt	189			P
7440-50-8	Copper	564			P
7439-89-6	Iron	272000			P
7439-92-1	Lead	326			P
7439-95-4	Magnesium	62100			P
7439-96-5	Manganese	61400			P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	154			P
7440-09-7	Potassium	1090	B		P
7782-49-2	Selenium	5.6		~~N~~J	P
7440-22-4	Silver	11.0			P
7440-23-5	Sodium	2820	B		P
7440-28-0	Thallium	2.0	U	~~N~~J	P
7440-62-2	Vanadium	0.80	U	J	P
7440-66-6	Zinc	299000			P
_____	Cyanide				NR

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EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJAK98

Lab Name: SENTINEL INC. Contract: 68-D6-0001

Lab Code: SENTIN Case No.: 27338 SAS No.: SDG No.: MJAK97

Matrix (soil/water): WATER Lab Sample ID: 24783S

Level (low/med): LOW Date Received: 09/11/99

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	211000			P
7440-36-0	Antimony	112		~~N~~ J	P
7440-38-2	Arsenic	9910			P
7440-39-3	Barium	17.6	B		P
7440-41-7	Beryllium	26.6			P
7440-43-9	Cadmium	9480		J	P
7440-70-2	Calcium	124000			P
7440-47-3	Chromium	46.4			P
7440-48-4	Cobalt	3060			P
7440-50-8	Copper	13200			P
7439-89-6	Iron	14500000			P
7439-92-1	Lead	334			P
7439-95-4	Magnesium	293000			P
7439-96-5	Manganese	23100		J	P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	2550			P
7440-09-7	Potassium	100	B		P
7782-49-2	Selenium	1.8	U	~~N~~	P
7440-22-4	Silver	0.40	U		P
7440-23-5	Sodium	213000			P
7440-28-0	Thallium	2.0	U	N J	P
7440-62-2	Vanadium	0.80	U	J	P
7440-66-6	Zinc	18900000			P
	Cyanide				NR

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11/24/99

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJAK99

Lab Name: SENTINEL INC. Contract: 68-D6-0001

Lab Code: SENTIN Case No.: 27338 SAS No.: SDG No.: MJAK97

Matrix (soil/water): WATER Lab Sample ID: 24784S

Level (low/med): LOW Date Received: 09/11/99

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	67700			P
7440-36-0	Antimony	23.6	B	~~U~~ ~~N~~ J	P
7440-38-2	Arsenic	1970			P
7440-39-3	Barium	7.2	B	U	P
7440-41-7	Beryllium	11.8			P
7440-43-9	Cadmium	3000			P
7440-70-2	Calcium	60400			P
7440-47-3	Chromium	20.3			P
7440-48-4	Cobalt	1010			P
7440-50-8	Copper	4540			P
7439-89-6	Iron	2020000			P
7439-92-1	Lead	550			P
7439-95-4	Magnesium	185000			P
7439-96-5	Manganese	344000			P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	738			P
7440-09-7	Potassium	792	B		P
7782-49-2	Selenium	27.5		~~N~~ J	P
7440-22-4	Silver	4.5	B		P
7440-23-5	Sodium	43300			P
7440-28-0	Thallium	2.0	U	~~N~~ J	P
7440-62-2	Vanadium	0.80	U	J	P
7440-66-6	Zinc	1680000			P
	Cyanide				NR

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EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJAL00

Lab Name: SENTINEL INC. Contract: 68-D6-0001

Lab Code: SENTIN Case No.: 27338 SAS No.: SDG No.: MJAK97

Matrix (soil/water): WATER Lab Sample ID: 24785S

Level (low/med): LOW Date Received: 09/11/99

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	658			P
7440-36-0	Antimony	2.2	U	N J	P
7440-38-2	Arsenic	10.2			P
7440-39-3	Barium	5.5	B	U	P
7440-41-7	Beryllium	0.30	B		P
7440-43-9	Cadmium	0.70	B	U	P
7440-70-2	Calcium	3890	B		P
7440-47-3	Chromium	0.30	U	J	P
7440-48-4	Cobalt	9.6	B		P
7440-50-8	Copper	2.0	U		P
7439-89-6	Iron	18600			P
7439-92-1	Lead	26.7			P
7439-95-4	Magnesium	1930	B		P
7439-96-5	Manganese	2320			P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	5.5	B		P
7440-09-7	Potassium	842	B		P
7782-49-2	Selenium	1.8	U	N	P
7440-22-4	Silver	0.40	B		P
7440-23-5	Sodium	674	B		P
7440-28-0	Thallium	2.0	U	N J	P
7440-62-2	Vanadium	0.80	U		P
7440-66-6	Zinc	700		U	P
	Cyanide				NR

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EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJAL01

Lab Name: SENTINEL INC. Contract: 68-D6-0001

Lab Code: SENTIN Case No.: 27338 SAS No.: SDG No.: MJAK97

Matrix (soil/water): WATER Lab Sample ID: 24786S

Level (low/med): LOW Date Received: 09/11/99

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	2560			P
7440-36-0	Antimony	2.2	U	NJ	P
7440-38-2	Arsenic	15.4			P
7440-39-3	Barium	19.8	B		P
7440-41-7	Beryllium	1.0	B		P
7440-43-9	Cadmium	153		J	P
7440-70-2	Calcium	206000			P
7440-47-3	Chromium	1.4	B	UJ	P
7440-48-4	Cobalt	190			P
7440-50-8	Copper	151			P
7439-89-6	Iron	92000			P
7439-92-1	Lead	512			P
7439-95-4	Magnesium	246000			P
7439-96-5	Manganese	188000			P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	171			P
7440-09-7	Potassium	10500			P
7782-49-2	Selenium	23.2		NJ	P
7440-22-4	Silver	21.6			P
7440-23-5	Sodium	2560	B		P
7440-28-0	Thallium	2.0	U	NJ	P
7440-62-2	Vanadium	0.80	U	J	P
7440-66-6	Zinc	89700			P
	Cyanide				NR

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJAL02

Lab Name: SENTINEL INC. Contract: 68-D6-0001

Lab Code: SENTIN Case No.: 27338 SAS No.: SDG No.: MJAK97

Matrix (soil/water): WATER Lab Sample ID: 24787S

Level (low/med): LOW Date Received: 09/11/99

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	43.2	U		P
7440-36-0	Antimony	2.2	U	~~N~~ J	P
7440-38-2	Arsenic	2.1	U		P
7440-39-3	Barium	70.8	B		P
7440-41-7	Beryllium	0.10	B		P
7440-43-9	Cadmium	16.0			P
7440-70-2	Calcium	19800			P
7440-47-3	Chromium	0.30	U	J	P
7440-48-4	Cobalt	18.0	B		P
7440-50-8	Copper	3.8	B		P
7439-89-6	Iron	1670		J	P
7439-92-1	Lead	302			P
7439-95-4	Magnesium	36800			P
7439-96-5	Manganese	12000			P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	23.2	B		P
7440-09-7	Potassium	1290	B		P
7782-49-2	Selenium	1.8	U	~~N~~	P
7440-22-4	Silver	0.80	B		P
7440-23-5	Sodium	1040	B		P
7440-28-0	Thallium	2.0	U	~~N~~ J	P
7440-62-2	Vanadium	0.80	U		P
7440-66-6	Zinc	4010		J	P
	Cyanide				NR

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EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJAL03

Lab Name: SENTINEL INC. Contract: 68-D6-0001

Lab Code: SENTIN Case No.: 27338 SAS No.: SDG No.: MJAK97

Matrix (soil/water): WATER Lab Sample ID: 24788S

Level (low/med): LOW Date Received: 09/11/99

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	601			P
7440-36-0	Antimony	2.2	U	~~N~~ J	P
7440-38-2	Arsenic	5.6	B		P
7440-39-3	Barium	20.4	B		P
7440-41-7	Beryllium	0.40	B		P
7440-43-9	Cadmium	56.0			P
7440-70-2	Calcium	11000			P
7440-47-3	Chromium	0.40	B	J	P
7440-48-4	Cobalt	12.2	B		P
7440-50-8	Copper	25.2			P
7439-89-6	Iron	15200			P
7439-92-1	Lead	440			P
7439-95-4	Magnesium	16900			P
7439-96-5	Manganese	15300			P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	13.2	B		P
7440-09-7	Potassium	852	B		P
7782-49-2	Selenium	1.8	U	~~N~~	P
7440-22-4	Silver	2.1	B		P
7440-23-5	Sodium	412	B		P
7440-28-0	Thallium	2.0	U	~~N~~ J	P
7440-62-2	Vanadium	0.80	U		P
7440-66-6	Zinc	23700			P
_____	Cyanide				NR

11/24/99

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EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJAL04

Lab Name: SENTINEL INC. Contract: 68-D6-0001

Lab Code: SENTIN Case No.: 27338 SAS No.: SDG No.: MJAK97

Matrix (soil/water): WATER Lab Sample ID: 24789S

Level (low/med): LOW Date Received: 09/11/99

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	40900			P
7440-36-0	Antimony	7.3	~~B~~	~~UNJ~~	P
7440-38-2	Arsenic	1790			P
7440-39-3	Barium	4.6	~~B~~	U	P
7440-41-7	Beryllium	7.1			P
7440-43-9	Cadmium	2700			P
7440-70-2	Calcium	119000			P
7440-47-3	Chromium	9.8	~~B~~	UJ	P
7440-48-4	Cobalt	870			P
7440-50-8	Copper	3240			P
7439-89-6	Iron	883000			P
7439-92-1	Lead	753			P
7439-95-4	Magnesium	129000			P
7439-96-5	Manganese	133000			P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	752			P
7440-09-7	Potassium	954	B		P
7782-49-2	Selenium	15.7		~~NJ~~	P
7440-22-4	Silver	24.8			P
7440-23-5	Sodium	26700			P
7440-28-0	Thallium	2.0	U	~~NJ~~	P
7440-62-2	Vanadium	0.80	U	J	P
7440-66-6	Zinc	1100000			P
	Cyanide				NR

11/24/99

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EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJAL05

Lab Name: SENTINEL INC. Contract: 68-D6-0001

Lab Code: SENTIN Case No.: 27338 SAS No.: SDG No.: MJAK97

Matrix (soil/water): WATER Lab Sample ID: 24790S

Level (low/med): LOW Date Received: 09/11/99

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	2750			P
7440-36-0	Antimony	2.2	U	~~N~~ J	P
7440-38-2	Arsenic	15.8			P
7440-39-3	Barium	21.8	B		P
7440-41-7	Beryllium	1.0	B		P
7440-43-9	Cadmium	166			P
7440-70-2	Calcium	220000			P
7440-47-3	Chromium	3.2	B		P
7440-48-4	Cobalt	204			P
7440-50-8	Copper	164			P
7439-89-6	Iron	97900			P
7439-92-1	Lead	550			P
7439-95-4	Magnesium	265000			P
7439-96-5	Manganese	204000			P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	185			P
7440-09-7	Potassium	11200			P
7782-49-2	Selenium	23.8		~~N~~ J	P
7440-22-4	Silver	24.9			P
7440-23-5	Sodium	2880	B		P
7440-28-0	Thallium	2.0	U	N J	P
7440-62-2	Vanadium	0.80	U	J	P
7440-66-6	Zinc	97400			P
_____	Cyanide				NR

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJAL06

Lab Name: SENTINEL INC. Contract: 68-D6-0001

Lab Code: SENTIN Case No.: 27338 SAS No.: SDG No.: MJAK97

Matrix (soil/water): WATER Lab Sample ID: 24791S

Level (low/med): LOW Date Received: 09/11/99

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	244		UJ	P
7440-36-0	Antimony	2.2	U	NJ	P
7440-38-2	Arsenic	36.4			P
7440-39-3	Barium	15.6	B		P
7440-41-7	Beryllium	0.40	B		P
7440-43-9	Cadmium	19.4			P
7440-70-2	Calcium	452000			P
7440-47-3	Chromium	5.4	B	UJ	P
7440-48-4	Cobalt	351			P
7440-50-8	Copper	2.0	U		P
7439-89-6	Iron	204000			P
7439-92-1	Lead	769			P
7439-95-4	Magnesium	536000			P
7439-96-5	Manganese	466000			P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	321			P
7440-09-7	Potassium	26400			P
7782-49-2	Selenium	81.0		NJ	P
7440-22-4	Silver	52.6			P
7440-23-5	Sodium	6390			P
7440-28-0	Thallium	2.0	U	NJ	P
7440-62-2	Vanadium	0.80	U	J	P
7440-66-6	Zinc	52000			P
	Cyanide				NR

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments: